The Diagnosis of Intestinal Obstruction in the Newborn

A Review of the Literature with a Report of Eight Additional Cases

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SUMMARY

Because the clinical appearance of newborn infants having intestinal obstruction is disarmingly normal, vomiting is reason for immediate search for the cause. To this end the character of stools and meconium that are passed should be carefully observed, lest valuable time elapse before correct diagnosis is made.

In three cases of volvulus observed by the authors, there was moderate to pronounced distention of the abdomen at birth—a sign which may be helpful in diagnosis.

Roentgenograms are the most helpful diagnostic aid. Since the roentgenographic appearance of the normal infant abdomen differs from that of the adult, interpretations should be made with that in mind. In this connection the absence of gas shadows is significant. Although there are dangers in the use of barium in infants, early diagnosis is so important that use of the substance is justifiable if it will help in correct appraisal.

The treatment is always surgical, and the procedure of choice is primary anastomosis. Proper preoperative and postoperative care and treatment, including maintenance of fluid and electrolyte balance and blood volume, are of great importance.

AMONG the 8,305 live births at Mary's Help Hospital during the past five years, there were seven cases of intestinal obstruction which developed during the first five days of life. Four of these cases were the result of single or multiple atresia of the bowel; and three, of volvulus. This is a considerably higher incidence of atresia than has been reported by others. Webb and Wangensteen[12] reported that atresia occurred in one in every 20,000 births. Besides these seven cases, another, one of congenital atresia, is included. (The baby was delivered elsewhere but treated at Mary's Help Hospital.) Since the mortality in this condition is appallingly high, it was felt that an analysis and review of the eight cases might be profitable (see Table 1). Except in one case of volvulus, the general clinical appearance of the patients was strikingly normal, so that in some instances the diagnosis was not suspected until persistent vomiting and failure to pass meconium had occurred.

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The most common site of congenital atresia is the lower ileum. In Ladd's[7] 52 cases, the atresia was located in the ileum in 34; in Davis and Poynter's[2] series of 392 cases, the ileum was the site in 101. The next most common site is the duodenum. Atresia can also exist in the large bowel; in one series[2] it was found to occur there in about ten per cent of the cases. Frequently, these intestinal atresias are multiple. Davis and Poynter[2] in a series of 392 cases found multiple atresias in 15 per cent; Ladd[7] in his group of 52 cases found five per cent of the patients had multiple atresias. In about ten per cent of the cases other embryological defects are present, the most constant being an imperforate anus.[11] Other anomalies frequently associated with this condition are congenital cystic kidneys, malformations of the extremities, and congenital heart disease.

In the three cases of volvulus treated by the authors, the small intestine alone was involved. The rotation was in a clockwise direction, which is usually the case. In each of these cases the bowel was fixed in this position by numerous adhesions to adjacent structures.

DIAGNOSIS

Persistent vomiting in the newborn and failure to pass a normal stool should lead to suspicion of an anomaly of the bowel. Although intestinal obstruction is nearly always due to either congenital atresia or volvulus, vomiting due to other causes, such as intracranial lesions, enteral or parenteral infections, pyloric stenosis, pancreatic achylia, and paralytic ileus must be differentiated. Ordinarily the vomiting of pyloric stenosis commences in infants at the age of two weeks or later, but a few cases have been reported in which the vomiting occurred immediately after birth.[8] A very few cases of vomiting due to inspissated meconium resulting from pancreatic achylia have been reported.[5] In these cases, congenital stenosis of the pancreatic ducts was responsible. Adynamic or paralytic ileus is exceedingly rare in the newborn, but three cases have been reported in which vomiting was of that origin.[9] Whether or not the vomitus is bile-stained will depend upon the location of the lesion in relation to the ampulla of Vater. The vomitus usually contains no bile if the occlusion lies above or at the

level of the ampulla; however, occasionally, bile may seep through a tiny orifice. Although in the infrapyloric occlusions the vomitus contains bile, the presence of this substance may be difficult to recognize. The time of the onset of vomiting after birth has proven to be of little aid in determining the site of obstruction, for with air and digestive juices added to the amniotic fluid swallowed *in utero*,[6] the infant may start vomiting early even with a low obstruction. For example, in one of the cases of volvulus of the lower jejunum observed by the authors, vomiting began eight hours after birth, whereas in a case of duodenal atresia, vomiting did not occur until the fourth day.

The character of the stool may also be misleading. In four out of five of our cases of atresia the infants passed stools. In the fifth case, in which stools were absent, the patient had a complete rectal atresia associated with a duodenal stenosis. The color of the stools was green in three, and grayish in the fourth, but the consistency and gross appearance in all four cases were mucoid and the amount was scanty. Unfortunately no tests for bile were performed. That bile-tinged meconium can be passed despite complete obstruction below the ampulla of Vater was first reported by Cordes[1] in 1901. The possibility that these atresias develop after the fifth fetal month, when bile is normally present in the intestines, has been suggested by Wangensteen.[11] In contrast to those with atresia, none of our patients with volvulus passed stools. A very useful aid in establishing the diagnosis of intestinal atresia is the Farber test.*[6]

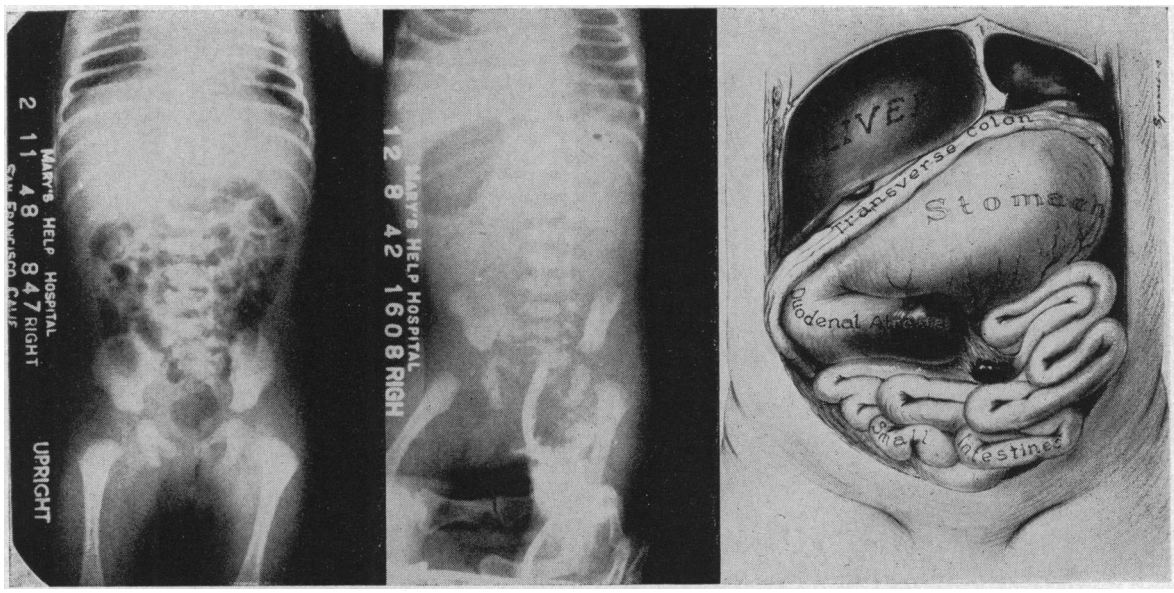
As was stated previously, the clinical appearance of infants with intestinal obstruction is anything but alarming. Most of those observed by the authors appeared to be in good nutritional condition. Even an infant with volvulus and complete gangrene of one bowel segment did not appear unusually ill. Distention in the group of patients with atresias was variable. In general it was not pronounced except in the infant with jejunal atresia. However, distention was a striking feature and was noted at the time of delivery in all the three cases of volvulus. This finding of distention may be a useful aid in differentiating volvulus from congenital atresia. Imperforate anus and rectal atresia, which so commonly complicate obstructions at higher levels, must be definitely ruled out. Digital examination is not entirely satisfactory for this purpose, and attempts to ascertain the patency of the rectum by probing with a catheter also may be unreliable, as the normal folds of the rectum may block the passage of the catheter. In several instances the authors, finding difficulty in passing a catheter, suspected rectal atresia, a suspicion that was quickly dissipated when a thin barium enema was given.

By far the most helpful diagnostic aid is the x-ray examination. Many observers[4] believe that a plain film of the abdomen gives sufficient information as to the presence of these anomalies. Others[9] with equal experience resort to the use of thin barium mixtures, both by mouth and rectum, when conclusive evidence cannot be derived from the plain abdominal film; and they feel that the danger of aspiration of the barium mixture has been exag-

*This test consists of examining a thin stained smear of the meconium for the presence of cornified epithelial cells which the fetus had ingested when swallowing amniotic fluid. The presence of these cells in the meconium indicates patency of the intestinal tract, while their absence indicates, quite definitely, a complete obstruction.

TABLE 1.—*Eight Case Reports in Tabular Form*

Cases	*Character and Time of Vomiting*	*Stools and Character*	*Abdominal Distention*	*X-Ray Findings*	*Surgical Procedure*	*Surgery Day*	*Postoperative Progress*	*Autopsy Findings*
CASE 1: Rectal atresia, duodenal stenosis	Bile-stained second day	None	Moderate on second day	Gas with distention in duodenum	Pull-through	Third	Vomiting; expired on seventh postoperative day	Duodenal stenosis
CASE 2: Duodenal atresia	Green, frothy fourth day	Daily from birth, green-yellow	Minimal	Gas with distention in duodenum	Duodenal jejunostomy	Eighth	Survived for 51 days; diarrhea	Severe inanition; anastomosis intact
CASE 3: Multiple atresia	Yellowish 12 hours after birth	None	None	Like a high bowel obstruction	Side-to-side	Fifth	Expired fifth postoperative day; vomiting	
CASE 4: Jejunal atresia	Bile-stained second day	Green mucus fourth day	Marked on second day	Small intestine distended	Side-to-side anastomosis	Sixth	Expired on second postoperative day	Rupture of anastomosis with peritonitis
CASE 5: Volvulus, lower jejunum and upper ileum		None	Moderate at birth	Many distended loops	Freeing adhesions; release of volvulus	Third	Good	
CASE 6: Volvulus, jejunum	Grayish-green 8 hours after birth	None	Moderate at birth	A few distended loops	Resection side-to-side	Third	Expired in 26 hours	Anastomosis intact; duodenum and first part of jejunum dilated
CASE 7: Volvulus, small intestine	Suction since birth	None	Marked	Absent gas shadows	Freed adhesions; release of volvulus	Third	Stormy; died fourth postoperative day	Peritonitis; partial recurrence of volvulus
CASE 8: Ileal atresia	Green-stained mucus	Green-stained	Moderate	Distended loops	End-to-side	Fourth	Good four days; died seventh postoperative day	Leak at anastomosis; localized peritonitis



A B C

Figure 1. A—Flat plate of abdomen of normal infant. B—Duodenal atresia. C—Duodenal atresia, operative findings.

gerated. The normal x-ray appearance of the infant abdomen differs considerably from that of the adult. In the adult abdomen, in the absence of obstruction, air is present only in the stomach and colon, whereas in the infant (Figure 1-A) air is normally present throughout the small intestines up to the age of two years. Therefore, in the infant, the absence of intestinal gas shadows is suggestive of obstruction.

In the case of duodenal atresia observed by the authors (Figure 1-B and C), the duodenum was considerably distended with gas, while there was no evidence of gas in the remaining small intestine. In a case of jejunal atresia, on the other hand, the small intestine was shown to be distended with gas (Figure 2). A lateral view showed one loop of intestine which was so distended that it was suspected of being large bowel. At operation this was found to be the terminal portion of the distended jejunum. The x-ray film of an infant with ileal atresia (Figure 3-A) revealed the small bowel to be similarly distended but a greater number of distended loops were seen, which naturally would be expected. In a case of multiple atresia the x-ray appearance was that of obstruction high in the small bowel. Actually an atresia was found six inches from the ligament of Treitz.

In volvulus gas may or may not pass into and be visualized in the small intestine. The authors believe that the non-passage of gas is dependent upon an associated malrotation of the midgut with resulting obstruction of the duodenum. The x-ray findings and physical signs in Case 7 (Figure 4-A) led to the erroneous diagnosis of abdominal ascites. Abdominal distention was pronounced and flank dullness was present. These observations, taken together with the absence of gas shadows and the increased diffuse density of the x-ray shadow, led to the erroneous diagnosis. However, when the abdomen was opened a volvulus of the lower ileum was found,

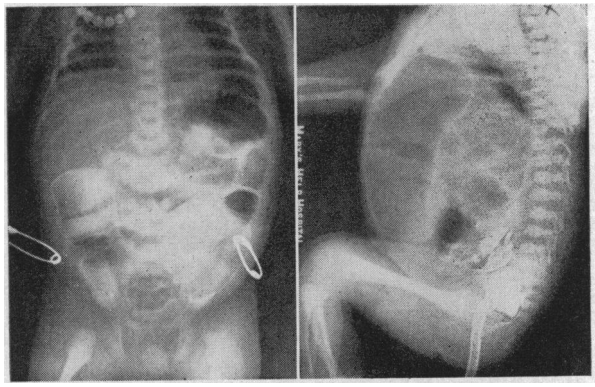
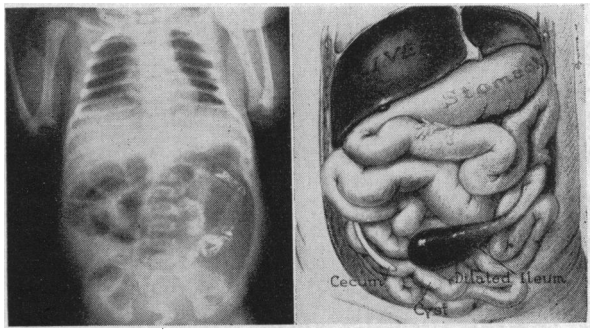


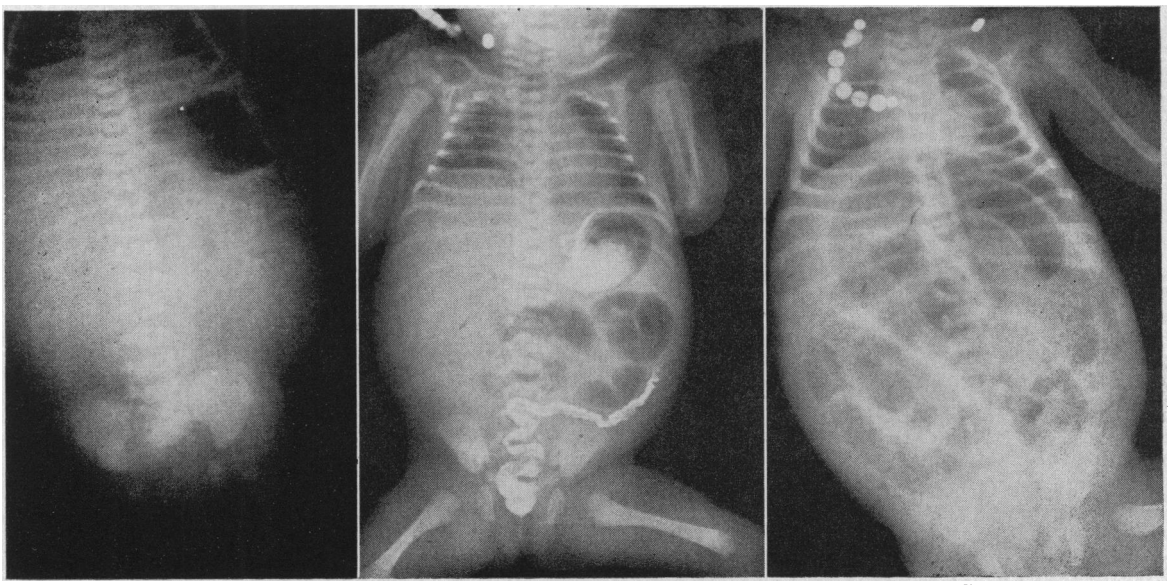
Figure 2.—Jejunal atresia, anterior-posterior and lateral views.



A B

Figure 3. A—Ileal atresia. B—Operative findings in Case 8 (Table 1).

with the twisted loop and bowel proximal to it filled with a thin meconium. There was no free peritoneal fluid. The absence of gas shadows on the x-ray film in this case was due to the small bowel being filled with meconium. In Case 6 (Figure 4-B) the x-ray film showed a few distended loops on the left side



A B C

Figure 4. A—Volvulus, showing pronounced abdominal distention and lack of gas. B—Volvulus with distention and moderate amount of gas. C—With distention and tremendous amount of gas.

of the abdomen. In a third case of volvulus, Case 5 (Figure 4-C), in which the patient survived the operation, there was a tremendous amount of gas in many distended loops on the day of birth and on the following day the distention of these loops had increased considerably.

Treatment, obviously surgical, should of course be instituted as early as the condition of the patient permits. The preoperative preparation of the infant is of paramount importance. Restoration of tissue fluids and electrolytes is vital. Transfusions of whole blood are indicated to maintain the normal blood volume. Preoperatively, stomach lavage, using a small-sized rubber catheter, to avoid the aspiration of vomitus during the operative procedure, should be employed. During the operation the catheter is retained to maintain decompression. In atresias the best surgical procedure is considered to be a side-to-side anastomosis of the upper patent segment to the lower patent segment. Intervening segments of bowel in multiple atresias are best left alone, as resection not only is unnecessary but jeopardizes the blood supply of the remaining bowel. Enterostomy should never be considered. In volvulus considerable dissection may be necessary to free and restore the bowel to its normal position.

PROGNOSIS

Until recently the outlook for infants with bowel obstructions of the kind under discussion was exceedingly poor. In a total of 500 cases reported up to 1931 there were only nine patients who survived operation,[12] and before 1942 there were no survivals from operations for multiple atresia.[3] Infants with an untreated complete atresia have been known to live as long as three weeks, but death usually occurs within six days after birth. In several instances in which the stenosis was incomplete, the infants have lived to maturity.[3] With earlier diagnosis, improved surgical technique and suture material, and the highly effective chemotherapeutic and antibiotic drugs, there have been many more survivals in the last few years. In 1947 Potts[10] reported five cases of atresia with four survivals, including the first recorded survival following operation for atresia of the transverse colon.

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